

1. THE FOLLOWING FORMAT APPLIES TO ALL COMPOUNDS IN THIS QUESTION:

Rb_2O
RUBIDIUM OXIDE

$$M_{Rb_2O} = 100g$$

$$\eta_{Rb_2O} = \frac{m}{mm}$$

$$mm_{Rb_2O} = 186.94 g/mol$$

$$= \frac{100}{186.94}$$

$$\eta_{Rb_2O} = ?$$

$$= 0.535 mol.$$

CaS
Calcium Sulfide

$$\eta_{CaS} = 1.39 mol$$

$FeBr_2$
IRON (II) BROMIDE

$$\eta_{FeBr_2} = 0.467 mol$$

Co_2O_3
COBALT (III) OXIDE

$$\eta_{Co_2O_3} = 0.603 mol$$

CrO_3
CHROMIUM (VI) OXIDE

$$\eta_{CrO_3} = 1.00 mol$$

Cr_2O_3
CHROMIUM (III) OXIDE

$$\eta_{Cr_2O_3} = 0.658 mol$$

$K_2Cr_2O_7$
POTASSIUM DICHROMATE

$$\eta_{K_2Cr_2O_7} = 0.346 mol$$

$ZnCl_2$
ZINC CHLORIDE

$$\eta_{ZnCl_2} = 0.734 mol$$

2. THE FOLLOWING FORMAT APPLIES TO ALL COMPOUNDS IN THIS QUESTION:

Al_2O_3
ALUMINUM OXIDE

$$n_{\text{Al}_2\text{O}_3} = 2.65 \text{ mol}$$

$$M_{\text{Al}_2\text{O}_3} = 1 \times \text{MM}$$

$$\text{MM}_{\text{Al}_2\text{O}_3} = 101.96 \text{ g/mol}$$

$$= 2.65 \times 101.96$$

$$M_{\text{Al}_2\text{O}_3} = ?$$

$$= 270.2 \text{ g}$$

CsF
CESIUM FLUORIDE

$$M_{\text{CsF}} = 402.6 \text{ g}$$

$\text{Ca}_3(\text{PO}_4)_2$
CALCIUM PHOSPHATE

$$M_{\text{Ca}_3(\text{PO}_4)_2} = 822.0 \text{ g}$$

$\text{Al}_2(\text{SO}_4)_3$
ALUMINUM SULFATE

$$M_{\text{Al}_2(\text{SO}_4)_3} = 906.7 \text{ g}$$

$\text{Pb}(\text{NO}_3)_2$
LEAD (II) NITRATE

$$M_{\text{Pb}(\text{NO}_3)_2} = 877.7 \text{ g}$$

NI_3
NITROGEN TRIIODIDE

$$M_{\text{NI}_3} = 1046 \text{ g}$$

N_2F_4
DINITROGEN TETRAFLUORIDE

$$M_{\text{N}_2\text{F}_4} = 275.6 \text{ g}$$

SiF_4
SILICON TETRAFLUORIDE

$$M_{\text{SiF}_4} = 275.8 \text{ g}$$

#3 1 mol of $C_6H_{12}O_6$

$$\begin{aligned}\# \text{MOLECULES} &= \eta \times Av \# \\ &= 1 \times 6.02 \times 10^{23} \\ &= 6.02 \times 10^{23}\end{aligned}$$

$$\begin{aligned}\# \text{H ATOMS} &= 12 \times \# \text{MOLECULES} \\ &= 12 \times 6.02 \times 10^{23} \\ &= 7.22 \times 10^{24}\end{aligned}$$

3 mol of CH_4

$$\begin{aligned}\# \text{molecules} &= \eta \times Av \# \\ &= 3 \times 6.02 \times 10^{23} \\ &= 1.806 \times 10^{24}\end{aligned}$$

$$\begin{aligned}\# \text{H ATOMS} &= 4 \times \# \text{MOLECULES} \\ &= 4 \times 1.806 \times 10^{24} \\ &= 7.22 \times 10^{24}\end{aligned}$$

4 mol of H_3PO_4

$$\begin{aligned}\# \text{MOLECULES} &= \eta \times Av \# \\ &= 4 \times 6.02 \times 10^{23} \\ &= 2.408 \times 10^{24}\end{aligned}$$

$$\begin{aligned}\# \text{H ATOMS} &= 3 \times \# \text{MOLECULES} \\ &= 7.22 \times 10^{24}\end{aligned}$$

#4 THE FOLLOWING FORMAT APPLIES TO ALL COMPOUNDS

NITROGEN MONOXIDE



$$\begin{aligned}\eta &= 25g \\ mm &= 30.01 g/mol \\ \eta &= \frac{m}{mm} \\ &= 0.833 \text{ mol}\end{aligned}$$

$$\begin{aligned}\# \text{MOLECULES} &= \eta \times Av \# \\ &= 0.833 \times 6.02 \times 10^{23} \\ &= 5.015 \times 10^{23}\end{aligned}$$

$$\begin{aligned}\# \text{O ATOMS} &= 1 \times \# \text{MOLECULES} \\ &= 5.02 \times 10^{23}\end{aligned}$$

POTASSIUM HYPOCHLORITE



$$\# \text{O ATOMS} = 1.66 \times 10^{23}$$

IRON(III) PERIODATE



$$\# \text{O ATOMS} = 2.87 \times 10^{23}$$

SODIUM CARBONATE



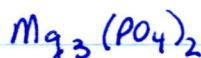
$$\# \text{O ATOMS} = 4.26 \times 10^{23}$$

AMMONIUM NITRATE



$$\# \text{O ATOMS} = 5.64 \times 10^{23}$$

MAGNESIUM PHOSPHATE



$$\# \text{O ATOMS} = 4.58 \times 10^{23}$$

SODIUM HYDROGEN CARBONATE



$$\# \text{O ATOMS} = 5.37 \times 10^{23}$$

CESIUM BROMATE



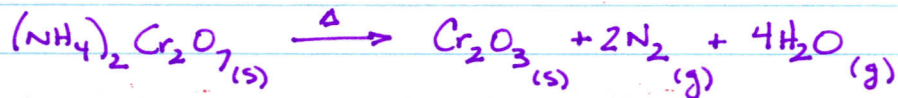
$$\# \text{O ATOMS} = 1.73 \times 10^{23}$$

VANADIUM(V) OXIDE



$$\# \text{O ATOMS} = 4.14 \times 10^{23}$$

#5



m 10.8 g
mm 252.1 g/mol
 η 0.0428 mol

$$\eta = m/mm$$

6.51 g 152 g/mol 0.0428
2.40 g 28.02 g/mol 0.0856
3.09 g 18.02 g/mol 0.1712

$$\begin{aligned} n &= \eta \times mm \\ &= 0.1712 \times 18.02 \\ &= 3.09 \text{ g} \end{aligned}$$

$$\frac{1 (NH_4)_2Cr_2O_7}{2 N_2} = \frac{0.0428 (NH_4)_2Cr_2O_7}{x}$$

$$x = 2 \times 0.0428 = 0.0856 \text{ mol } N_2$$

$$\#5(c) \quad \eta_{H_2O} = 0.1712$$

$$\begin{aligned} \# H_2O \text{ MOLECULES} &= \eta \times Av \# \\ &= 1.03 \times 10^{23} \end{aligned}$$

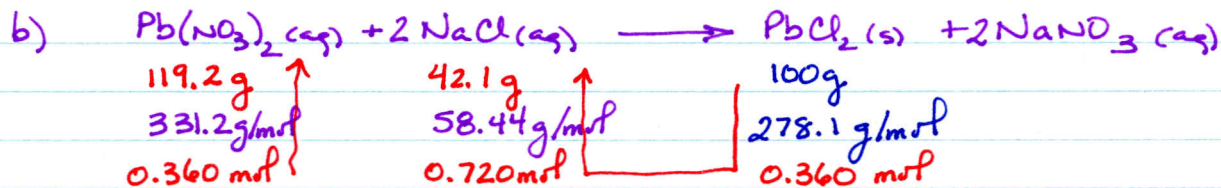
$$(d) \quad \eta_{Cr_2O_3} = 0.0428$$

$$\begin{aligned} \# Cr_2O_3 \text{ MOLECULES} &= \eta \times Av \# \\ &= 0.0428 \times 6.02 \times 10^{23} \\ &= 2.58 \times 10^{22} \end{aligned}$$

$$\begin{aligned} \# Cr \text{ ATOMS} &= 2 \times \# \text{ MOLECULES} \\ &= 5.16 \times 10^{22} \end{aligned}$$

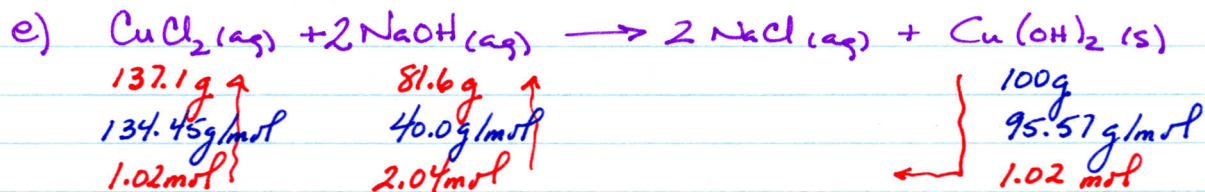


m	56.6 g	111.9 g	100 g
mm	132.16 g/mol	261.35 g/mol	233.39 g/mol
η	0.428 mol	0.428 mol	0.428 mol



c) N.R.

d) N.R.



#7 NH_3 IS THE FIRST REACTANT (UNKNOWN)

HNO_3 IS THE LAST PRODUCT (KNOWN)

→ GOTTA WORK BACKWARDS



m
mm
?

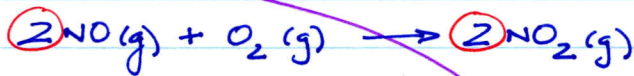
2.381×10^7
THIS ITEM IS
PRODUCT IN
2ND RXN

$1.0 \times 10^9 \text{ g}$
 63.02 g/mol
 $1.587 \times 10^7 \text{ mol}$

$$\frac{3 \text{NO}_2}{2 \text{HNO}_3} = \frac{x \text{NO}_2}{1.587 \times 10^7 \text{HNO}_3}$$

$$2x = 3 \times 1.587 \times 10^7$$

$$x = 2.381 \times 10^7$$



m
mm
?

2.381×10^7 ← 2.381×10^7

THIS ITEM IS
A PRODUCT IN
FIRST RXN + IS
USED IN THE 2ND RXN



m
mm
?

$1.014 \times 10^8 \text{ g}$
 17.04 g/mol
 5.95×10^6

← 2.381×10^7

$$\frac{1 \text{NH}_3}{4 \text{NO}} = \frac{x}{2.381 \times 10^7}$$

$$4x = 2.381 \times 10^7$$

$$x = 5.95 \times 10^6$$

$$\begin{aligned} m &= ? \times mm = 5.95 \times 10^6 \times 17.04 \\ &= 1.014 \times 10^8 \text{ g} \\ &= 101,400 \text{ kg} \end{aligned}$$